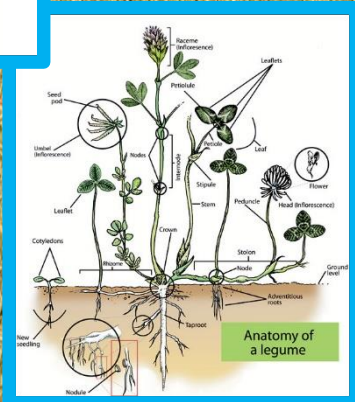
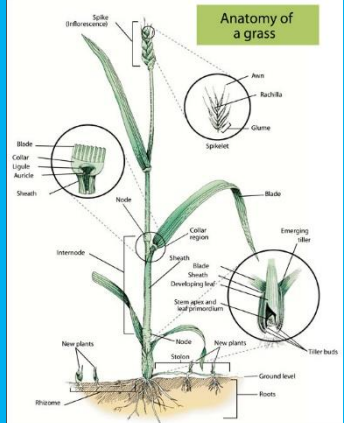


Hay Selection & Evaluation



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Introduction:

The selection and evaluation of hay can be a critical management practice for livestock producers in Texas, especially when they are purchasing hay from an outside source. The selection of hay is perhaps the most important decision that a rancher will make on an annual basis. This decision is particularly important as their herd nutrition throughout the harshest conditions of each year is strongly tied to the hay that is fed. Although a chemical analysis of a hay sample is the most reliable tool in evaluating the quality of hay, a chemical analysis can't completely indicate everything in the sample such as palatability, foreign matter, etc. In addition, a chemical analysis when purchasing hay is not always possible or practical in some situations. Therefore, learning to select and evaluate hay based on physical features is a critical skill needed by all livestock producers. In grading hay samples, a producer should evaluate Maturity, Texture, Leafiness, Foreign Matter, and Color. In light of the fact that Texas has endured several droughts in the past decade and producers have been forced to purchase and feed a variety of hay types from all over the United States, it is important for producers to understand the different types and characteristics of various hays. For example, producers need to know that pliability of a bermudagrass sample is quite different from the pliability of a sorghum-sudangrass sample. Once producers understand the five categories of hay grading, they can apply the principles learned to compare and select hay from a variety of samples that are available.

Hay Grading:

In the Texas FFA Forage Evaluation Career Development Event, FFA members are asked to grade ten hay samples based on the five categories of Maturity, Texture, Leafiness, Foreign Matter, and Color. Each sample is worth a total of 10 points for a grand total of 100 points for the grading portion. The point system is as follows:

	Maturity	Texture	Leafiness	Foreign Matter	Color
Grass	4	2	1	2	1
Legume	2	2	3	2	1

When grading hay samples it is important that FFA members learn the particular characteristics of various types of hay when assessing a grade in each category.

Maturity:

Maturity is the most important category to determine in grass hays and have a high level of importance in legumes as well. The quality of grass forage, particularly its digestible energy value, is directly correlated to the maturity of the grass. The quality and maturity of grass forage are inversely related. Young grasses will have high digestibility while more mature grass will typically contain more lignified tissues (fibrous content) and be lower in quality. Younger plants also generally have a higher percentage of leaf in relation to stem, and the nutritional value of that leaf is considerably higher (more digestible) than that of stem tissue. In more mature plants, the percentage of leaf decreases while the percentage of stem increases and much of the energy produced by photosynthesis is diverted to seed production resulting in lower nutritive value and digestibility. Maturity in grasses is commonly determined by the presence/absence and/or the stage of development of seed heads, whereas a legume's maturity is determined by the presence and stage of flower blooms or seed pods.

Maturity in Grasses:

Pre-boot- Grass samples with no seed-heads present are designated as pre-boot and are generally considered high quality when evaluating hay samples.

Boot- Grass samples with seed heads in the boot stage are designated as boot. A boot is when the seed head is still within the leaf sheath and has not fully emerged. Bermudagrass samples are rarely in this stage since it is a very short stage and varies within a field resulting in some plants being in the boot stage while others may be fully headed, resulting in a Fully Headed designation. The boot stage in bahiagrass is very rare, due to the extremely short time this species is in the boot stage. However, the boot stage is longer and more obvious in grasses such as annual sorghums, wheat, oats, and johnson-grass.

Fully Headed- Grass samples with seed heads present or inflorescences (flowering stalks) present are designated as fully headed. If a single seed head is located in a sample, it should be considered Fully Headed. In some cases, it is difficult to see seedheads from which the seeds have shattered, but those samples are considered to be Fully Headed as well.

Maturity in Legumes: The maturity of legumes is based on the presence of or stage of blooms (flowers) or seedpods. The most popular and widely produced legume used for hay in the U.S. is alfalfa and it is also the most common legume used in hay grading competitions, but other legumes, such as white clover, red clover, crimson clover, and vetch may be used as hay also. Alfalfa blooms in a fresh sample are purple in color, but it should be noted that as a sample ages the purple blooms fade in color and require careful inspection to identify in a sample. Seedpods in alfalfa are coiled and will likely be obvious, if present. Since these are an indication of advanced maturity, the Full Bloom designation should be applied to them.

Pre-Bloom- Legume samples that have no blooms within the sample are designated as Pre-Bloom.

1/10th Bloom- Legume samples with roughly 15 blooms or less within the sample are designated as 1/10th bloom.

Full Bloom- Legume samples with more than 15 blooms within the sample are designated as Full Bloom.

Texture:

The texture of a hay sample is evaluated to determine the amount of lignification in the sample. Lignification is tied directly to the digestibility of the hay sample. Lignin is a cell wall structural element that allows plants to stand erect and produce more total biomass. However, it is considered to be an indigestible component of forages and high lignin levels are less desirable. The designated textures of hay for this contest are Pliable/Small, Moderately Pliable/Medium, and Un-Pliable/Large. Samples designated as Pliable would have lower levels of lignification and an Un-Pliable sample would be more lignified. FFA members must understand the various types of hay in order to properly assess the texture of a sample as pliability varies among species. While pliability is a common indicator of lignification in the stems, there are hay production practices that may render a sample more pliable while not actually reducing the degree of lignification. A hay conditioner, for example, is used to crush, crimp, or otherwise damage the stem to speed the drying rate of the hay. Machinery used when processing hay many change the pliability. For example, if alfalfa hay has a stem size of medium but is conditioned utilizing machinery, it may be considered pliable. So, in some cases, a hay sample may have a relatively large stem diameter, yet still feel soft and pliable to the touch. If the hay sample is soft to the touch (using the back of the hand), the sample should be considered pliable. If it is harsh or brittle (woody) feeling, then it should be considered unpliant. FFA members can identify if stems have been conditioned by observing if the stems in the sample are abnormally flattened. Texture or pliability can also be affected by crop density. For example, a dense alfalfa crop may

produce a small stem size, yet still produce an unpliable and poorly digestible hay. If there are excessive stems in a sample due to high crop density, lignin content could still be relatively high as there is a high portion of stem compared to leaf, often resulting in a medium pliability. Small stem size resulting from high density could actually have higher lignin content than a medium size stem due to the increased surface area of stem since the greatest lignin deposition occurs in the outer “rind” of the stem.

Pliable/Small- Typically leaves are very fine with little stem present, realizing that a fine bermudagrass leaf is far different than a fine sorghum-sudangrass leaf. FFA members may only utilize the back of their hand to determine pliability. If the hay sample is soft with little indication of lignification, it should be designated as Pliable/Small. Typically legumes are evaluated based on stem size. Conventional thought is that a small stem size would result in a pliable/small texture. However, a small stem size with a high density would actually have a higher lignin content than some hay samples with a medium stem size. In addition, medium stem sized legumes and large stemmed grasses that have been conditioned with machinery to allow for more rapid moisture loss during curing may have higher digestible energy levels than unconditioned hay and could be designated as pliable. Higher quality hays used for feeding horses and dairy animals should be very pliable.

Moderately Pliable / Medium- Due to producers balancing quality and quantity in hay production, most hays produced in Texas are moderate in pliability. These samples are relatively soft but there are obvious stems within the sample. However, most samples with a moderate pliability will have a higher percentage of leaf as opposed to stem.

Un-Pliable/Large- Un-Pliable/Large textures are the least likely to be seen under normal conditions as most producers would not desire to harvest hays with this texture. However, in drought conditions or periods of excessive rain, proper timing may be difficult and producers are often forced to harvest any forage that might be available. Un-pliable/Large textures typically have a higher percentage of stem as opposed to leaf and the hay is very harsh or brittle to the touch.

Leafiness:

Determining the leafiness of a hay sample is simply evaluating the leaf to stem ratio and ensuring that there is minimal leaf fragmentation.

Leafy- Leafy samples with more than 50% leaf with most leaves attached to the stem.

Shattered- A sample with the majority of the leaf separated from the stem due to excessive handling or storage should be designated as shattered. Samples are considered shattered if there is considerable leaf fragmentation resulting in a loss of a majority of the leaf when feeding it to livestock. Grasses that are shattered will have short leaves and stems due to excessive handling in the harvesting procedures.

Stemmy- Hay samples with more than 50% stem will be designated as stemmy.

Foreign Matter:

Hay samples that contain something other than what the hay sample is labeled, will be designated as Foreign Matter. In this section, students can designate multiple types of foreign matter on the scan sheet for the same sample of hay. In grading this section, a FFA member must mark all that are present to receive credit for this section. Hay samples should be designated as Clean, Weeds, Stubble, Mold, and Other.

Clean- A sample that has no foreign matter or only a trace of foreign matter is designated as clean.

Weeds- Any plant material other than what is labeled on the hay sample should be designated as weeds. Weeds could be forbs such as croton, ragweed, etc.; woody plants such as mesquite, yaupon, etc.; or other grasses such as bahiagrass, crabgrass, etc. Other grasses in some hay samples may be palatable and nutritious for livestock but reduce the marketability of hay and therefore should be considered a weed. An example would be bahiagrass in bermudagrass sample or crabgrass in bermudagrass sample. Contest providers will label samples as they would be marketed. For example, providers will not label a sample bahiagrass if the sample contains bermudagrass, as bermudagrass in a bahiagrass sample is not generally considered a weed and would increase the value of the sample. Samples of this type should be labeled as a “mix grass” and would be designated as clean. Likewise, if a sample of predominantly crabgrass hay containing other normally desirable hay species is used in the contest, it should be labeled as a “mixed grass” sample and designated as clean, provided no other undesirable weeds are present.

Stubble- Hay samples containing roots or excessive rhizomes/stolons should be designated as stubble. Stubble is a result of hay equipment such as rakes set incorrectly, thus drawing in roots and rhizomes/stolons into the windrow of the hay. Stubble decreases the overall nutritional value and palatability of hay.

Other- Hay samples containing material that do not fit into any of the other categories within the Foreign Matter section should be designated as other. Examples would be trash, manure, pine straw, barbwire, etc.

Mold- Hay samples containing mold should be designated as mold. Mold is among the worst of the foreign matter as it is typically the least palatable and contains lower nutritive value than hay without mold. The presence of mold in hay is normally detected by smelling the sample and/or observing a noticeably darker than normal color.

Color:

Color in a hay sample can indicate the presence or lack of Vitamin A or its precursor beta carotene. It can also be an indicator of mold. Although color is a factor to consider in selecting and evaluating hay, it is the least important of the five factors evaluated simply because a loss of green color may not be a strong indicator of overall hay nutritive value. It is important to realize that all species do not possess the same color even when cured quickly and properly. For example, bahiagrass, even when properly cured, will be considered darker (less green) than well-cured bermudagrass. The bright designation may still be the proper one in this situation.

Bright- A hay sample designated with the color bright is a sample that is thought to be high in Vitamin A and beta carotene. Bright samples are typically greenish in color and appear to have been cured correctly, with little to no weathering.

Bleach- A hay sample designated as bleached typically lacks Vitamin A and beta carotene. Bleached samples typically are yellowish or tan in color and were likely allowed to lie in the field for an excessive period of time prior to baling. However, hay samples stored for long periods of time can develop into a bleached designation as time and storage will result in a loss of the Vitamin A and beta carotene in the leaf of the sample.

Dark- Dark samples are dark in color and are thought to be either moldy or approaching mold.

Non-Uniform- Hay samples that are a combination of colors mentioned above or do not fit into the colors mentioned above should be designated as Non-Uniform.

Hay Placing Classes:

FFA members are asked to place 4 classes of various hay types for a total of 50 points per class and a total of 200 points. FFA members are to rank the four samples from 1st to last and record their placing on the scantron. The scoring system used in Hay Grading is based on the importance of the hay category and can therefore be considered in placing a class of hay. For example, the maturity in grasses is worth 4 points whereas color is only worth 1 point in the Hay Grading point values. Therefore, when comparing samples, FFA members should place a higher emphasis on maturity as opposed to color when evaluating hay classes. The skills gained in grading hay samples should help FFA members in their evaluation and selection of samples. Contest providers will set the official placing on classes and assess cuts (degree of difficulty in evaluating a pair within the class).

Grasses:

Grass classes should be evaluated with the greatest emphasis placed on maturity. Hay samples with no seed heads will typically precede those samples that have seed heads. Exceptions to this rule would be if a pre-boot sample contains foreign matter such as mold. If samples all have seed heads, preference should be given to samples that have seed heads with less maturity and greater pliability. The maturity of seed heads can be determined by evaluating the amount of seed heads in the sample and the stage of the seed head. For example, in bahiagrass, a seed head that still has the seeds attached to the seed head is less mature than a seed head with none of the seeds still attached to the seed head. In terms of the amount of seed heads, if a bermudagrass sample only has a few seed heads in the sample and another sample has a tremendous amount of seed heads, the prior sample is most likely less mature and of higher quality. Of course other factors should be analyzed such as leafiness and pliability to further conclude the maturity and quality of the sample.

Leafiness and pliability can often be evaluated together. Samples with more leaf and finer leaves should be given priority in placing. However, it is important that FFA members realize the difference between the various types of samples when determining leafiness and pliability.

Samples containing foreign matter are typically moved toward the bottom of the class. However, foreign matter alone doesn't mean samples will automatically be last. Ultimately, FFA members must determine the sample palatability and quality in the placing of samples containing foreign matter. For example, if a sample contains a minimum amount of weeds such as bahiagrass in a bermudagrass sample, this sample may place high in the class if the sample excels in other areas such as maturity. If multiple samples within a class contain foreign matter, FFA members must once again make a determination as to which they think is of the highest nutritional quality. FFA members should keep in mind that of all the foreign matter within a

sample, mold is typically considered the worst as it is highly unpalatable and has most likely been robbed of its nutritive value.

In evaluating a class of hay, color is the least important and should be considered last. Bright samples are the preferred color. Next is typically non-uniform, then bleached, and lastly dark. Color should only be given priority when maturity, texture, leafiness, and foreign material are equal.

Legumes:

Legumes should be evaluated based on leafiness first. Leaf is by far the most important factor in evaluating legumes.

If the leafiness of samples is similar, maturity can be used to select the better sample as a less mature sample will typically have a greater nutritional value. In this situation, a maturity of pre-bloom is the highest quality, followed by 1/10th bloom and lastly full bloom.

When evaluating legumes, a smaller stem size is generally preferred but as mentioned earlier, density and conditioning can affect the pliability of samples and result in medium stem size legumes surpassing a smaller stem size legume. FFA members should select samples that they feel have the least amount of lignification when evaluating stem size and pliability.

Evaluating foreign matter and color in legumes would be the same as discussed above for grass hays.

The Hay Selection & Evaluation handout was developed in cooperation with Sam Houston State University Agriculture Department and the Rusk Agriculture Department.



**Sam Houston State
Agriculture Department**



**Rusk
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